DOL	- Direct On Line
DSM	- Demand Side Management
I/O	- Input/Output
IEA	- Import Export Assistant
MCC	- Motor Control Centre
PPRust	- Potgietersrus Platinum Mine
SAM	- System Automation & Management
VSD	- Variable Speed Drive

Abbreviations

Project implementation and integration of the PPRust concentrator

by R Els, SAM

With the current skills shortage in South Africa, how does one achieve high quality first world integration when implementing a multi-billion Rand concentrator project? It makes no sense when choosing quality products not to use a quality system integrator.

Anglo Platinum faced this situation when deciding to use Siemens PCS7 for the control of their flagship concentrator at Pogitiersrus in South Africa at the Potgietersrus Platinum Mine (PPRust). Anglo matched a tried and proven control system, PCS7, and a partner with dedication, professionalism and quality as company core principles. This ensured the project's success.

System Automation & Management (SAM) has been in existence for nearly 20 years and has a proven track record, not only in providing turnkey solutions to the mining industry, but across a broad spectrum of industries including power generation, automotive, cement, water, food and beverage. In addition, due to the power issues currently experienced SAM has been involved with a number of Demand Side Management (DSM) projects which have reduced power consumption. These have included the control of lighting systems, water purification and power supply reticulation and control in commercial industries.

The user requirements for PPRust

Anglo Platinum, building on its previous successful implementation of the Siemens PCS7 at its Mototolo plant, had a clear vision of what was required from the control system for PPRust—the most obvious was to continue the standardisation of control systems and function blocks and thus explore the possibilities that are offered by the use of the ANSI/ISA S88 standardisation. Using existing blocks, it is possible to create libraries that can be used in future projects, also ensuring a superior quality control and efficiency of such a system. Flexibility which allows continuous modification and adaptation of these libraries allows the user to remain current with changing products and process applications on the plant. Although the S88 was primarily designed for batching plants and was used by SAM in the Ursus Brewery, in Timisoara (Romania), it has been implemented in many other plants with great success.

A variation of this model was used for the PPRust plant. Its adaptation was primarily due to the in-line process of the plant. The S88 model allows for a plant area (process cell) to be divided into smaller more manageable units containing more 'sub' units with equipment modules within these units. Every process cell, unit, and equipment module contains a sequence controlling the units and equipment modules within them. Hold and wait conditions are nestled within the interlocks of devices to allow sequences to respond differently to different circumstances. If a hold occurs all the sequences are held in their current state, allowing the operator to see from an overview that a hold interlock/condition has occurred. From the overview the operator can drill down to the cause and remedy the cause. A wait condition depending on its severity may or may not be passed up the hierarchy as the cause may not be critical to the process and may clear on its own. An example of this is when a silo reaches a low level and stops. When the level reaches a satisfactory level the feeder can start-up on its own without requiring operator interaction (see *Figure 1*).

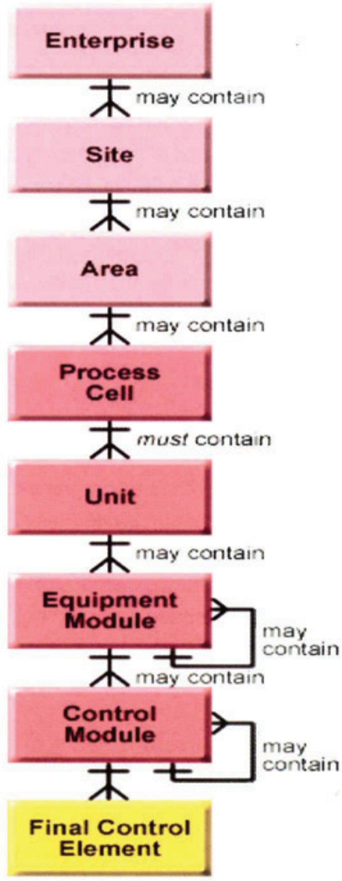

Figure 1: S88 control diagram.

The model has been implemented on PPRust with great success. Starting of plant areas is done speedily and with ease. The model has proven to be very effective on the plant and fault finding time has been dramatically reduced. After limited exposure operators have found the system easy to use, reducing the need for extended training.

The system needed to be robust which would minimise downtime.

- Skills shortage is affecting t industry.
- Control block libraries allow quality control and efficiency.
- Alarm suppression is of gre value, only alarming the prima cause of a fault and not the co sequential causes.
- Commitment plays a large role project success.

Take not

Such a system would have to be easy to use and troubleshoot. System integrators would then be able to support customer sites as the standard would be maintained throughout all installations and problems in the respective plants can be easily identified and solved. Changes required in the process could also be implemented in a test condition and if satisfactory results are achieved could be rolled out. Potential risks on the plant could thus be foreseen and a remedy applied before implementation.

A control system has to be expandable if additions are likely to be required to the plant. Such extensions should be seamless. This requirement is easily met by PCS7 as the addition of another control station was made during the engineering phase of the project.

The engineering of PCS7

During the engineering phase of the project it was decided to migrate from version 6.1 to version 7.0 as the customer required the latest offering of PCS7. The migration was performed over a weekend with no major impact on the completion of the engineering. This change allowed for the first implementation of version 7.0 in South Africa.

Acceleration of the project was requested during the engineering phase. This meant that additional personnel were required to complete the engineering portion by the desired completion date. This challenge was met as additional resources from both SAM's Johannesburg and Durban branches added their expertise to the project. While engineering was taking place in Johannesburg, commissioning of certain plant areas commenced in Potgietersrus. Although this is not the best solution while engineering the plant, it proved valuable in the acceleration process of an already fast-tracked project.

There were a number of vendor packages including the 16 MVA mill system for which ABB supplied drive control, large drives and a ball loading system which formed part of the control required in the project. Both packages were interfaced back to the PCS7 system by means of a DP-DP link. The ball loading, however, required some additional S7 engineering and commissioning to achieve the correct operation (see *Figure 2*).

Engineering software tools that were used in the engineering portion of the project included the Import Export Assistant (IEA) software. This is very useful in mass-engineering situations where one can make fast modifications to the project in other programs eg

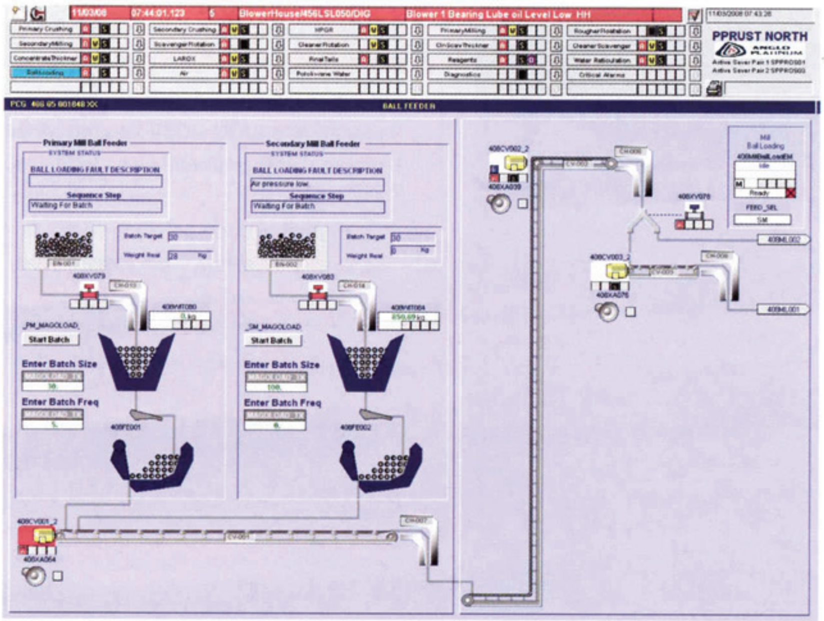

Figure 2: Ball loading displayed on PCS7 page.

Microsoft Excel and import, process tag names from customer lists using the IEA editor into the PCS7 system.

Alarm management was also configured on this project, which included the hiding of alarms that, under certain plant conditions, are of less importance. Depending on the operating status of a plant, messages are shown or hidden. Alarm suppression within the code also proved to be of great value, only alarming the primary cause of a fault and not the consequential causes. Although hidden alarms are not signalled visually, they are still logged and archived. Concurrent engineering allowed multiple engineers to work on one project, without having to split the project up into subprojects. The project is run on one of the participating engineering stations. All other engineering stations are configured as working project clients and can access the project data.

Commissioning of the plant

The plant consists of nine S7-417 automation stations controlling different sections of the plant. These are linked

Ryan Els has been involved in the industry for the last15 years. He has worked in the field services department for Siemens, commissioning variable speed drives, PLC and SCADA systems. He currently holds the position of project manager at SAM responsible for the PP Rust North project.

Ryan can be contacted on 011 803 0570 or ryan@sam.co.za.

About the author

to the clients by means of two redundant server pairs. In such a system, the use of redundant servers to maintain plant availability is critical. Should anything happen to one of the servers, or especially in the case of an upgrade or addition of extra functionality while the control system is required for process control, the redundant partner will be able to continue to support the operation.

Siemens Scalance X400 switches were used for the Ethernet connection between the servers, operating stations and automation stations. The X400 product range is a modular managed switch which allows one to achieve redundancy and 1 000 Mbit/s transmission. In addition, the use of the X400 provides diagnostic information to the control system, which means a complete view of the control system network is available to the operators.

The automation stations have additional Profibus CP cards that link to the remote Input/Output (I/O) stations and Motor Control Centres (MCCs). With more than 4 300 I/O points, and 726 motors the number of Profibus slaves dictates that in some areas more than two CPs per rack were required.

Remote I/O was mounted in stainless steel cubicles which are in excess of 123. These are linked via fibre optic cable to the automation stations. Siemens ET200M remote I/O stations were used, with a hot-swappable rail system. This allows for the changing of cards on the rack without the need to loose communication to other cards in the rack. The MCCs were also linked via fibre cable and consisted of intelligent components. ABB has supplied the Variable Speed Drives (VSDs) and Siemens Simocode ProV was used on all other Direct-On-Line (DOL) drives. The use of a bus system in the MCC has a number of advantages over the conventional I/O system as more data can be extracted from the intelligent devices and displayed without additional engineering required. Another benefit of using a bus system is that the diagnostics allows for easy fault finding. Nearly 40 km of fibre has been installed and 2,2 km of copper Profibus cable, connecting all VSDs, DOLs and remote I/Os. In addition to Profibus some vendors provided only DeviceNet as an interface, which required a protocol change as the information was required in the control system.

Commissioning of the plant was no mean feat. However, when applying good standards with quality work from an exceptional team, a net result of a quality project is inevitable.

Evaluation

The ease at which the PCS7 system was upgraded and the flexibility of the system contributed to the success of this implementation.

The expansion possibilities for such a system are great, as at any stage further plant sections with a large number of extra devices, with their associated equipment phases and units, can be added to the control system. Also, the processes currently operated can be further diversified and enhanced in many ways. Further plant expansions, or new greenfield plants, should be done by engineers who have gained experience on plants similar to this as it would ensure consistency in the quality of work provided.

Although this was a very successful project, at the forefront of any successful implementation a system integrator should ask itself certain questions to ensure continued improved service: How can we improve? How can we increase our efficiency? How can we provide a better solution to the customer? These principles of continuous improvement help keep one more competitive and provide the customer with an ever-improved offering. Service excellence from system integrators will become more prevalent in the years that follow when competitiveness on a global scale will be of utmost importance.

Conclusion

A way of overcoming the current and foreseeable future shortage of skills, when quality project implementation is required, is to select a system integrator that is capable of offering quality and dedication to the project. This project was a success due to the commitment of SAM, the client Vhumbanani, and the end-client Anglo Platinum.

Acknowledgements

Such a project could not have been completed successfully without the support and assistance of Siemens (South Africa). Their advice and co-operation helped to resolve many issues that arose during project implementation. In addition we would like to thank Anglo Platinum and Vhumbanani Projects for the opportunity given to SAM to be involved in this project.

SAM is proud to be associated with a project of this nature, where a challenge was met and overcome, with dedication and hard work. We as SAM will always keep this legacy of quality, and ownership, when providing solutions.